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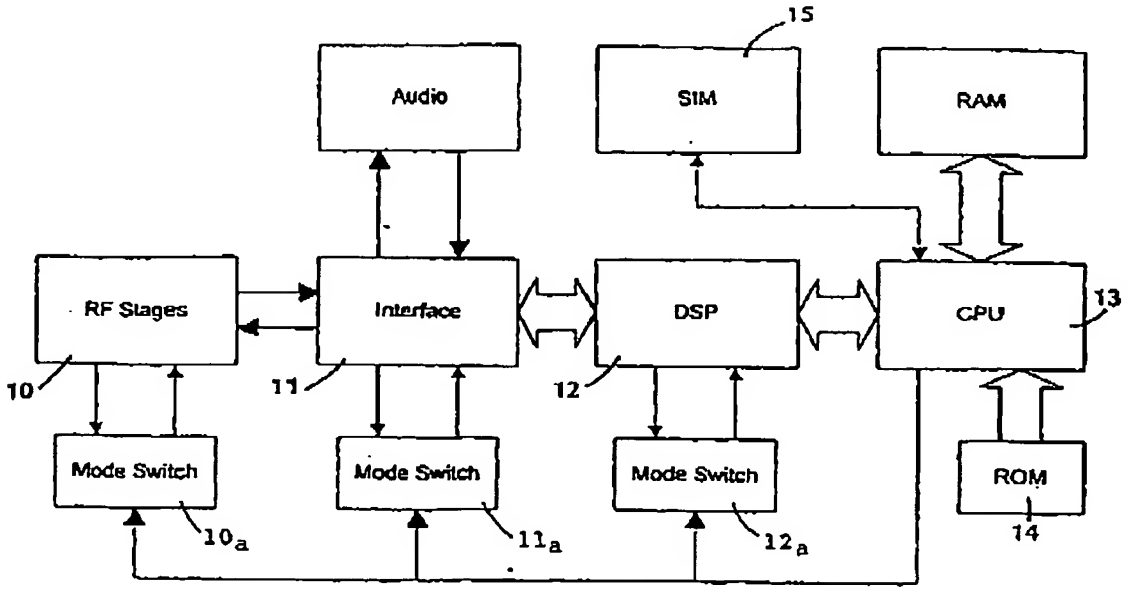
(54) Multi-band mobile telecommunications station

(57) A mobile telecommunications station for use in a multiple network environment is disclosed. The mobile telecommunications station includes a radio receiver capable of operating in a plurality of different frequency bands used by different networks. The mobile telecommunications station further includes a network preference data storage for storing data which identifies a level of priority for each network. At least one of the networks is a preferred network, and a search controller determines the search frequency at which each network is searched in accordance with the preference data.

Fig. 1



Description

[0001] This invention relates to a multi-band mobile telecommunications station for use in a multiple network environment, for example an environment in which there is a network of terrestrial base stations and another network of orbiting satellite stations.

2. Description of the Related Art:

[0002] The mobile station needs to be able to establish when it is in the coverage zone of any terrestrial base station or orbiting satellite station, but the operations required to enable the mobile station to search for such stations are power consuming.

[0003] It is accordingly an object of the present invention to provide a mobile telecommunications station which overcomes this problem.

[0004] A mobile telecommunications station in accordance with the invention includes a radio receiver capable of operating in a plurality of different frequency bands used by different networks, network preference data storage means for storing data which identifies a level of priority for each network, at least one of the networks being a preferred network, and a search control means determining the search frequency at which each network is searched in accordance with the preference data.

[0005] The search control means preferably varies the search strategy according to the network stations found in a previous search. For example, in GSM/Satellite dual mode mobile station, the search control means would normally reduce the frequency of satellite searches to a minimum. When the mobile station was not in the coverage zone of any GSM or Satellite base station, the frequency of both satellite and GSM scans would be increased. When the mobile station was not in the coverage zone of any GSM base station, but still in the coverage zone of a satellite network, the frequency of GSM scans would not be reduced.

[0006] The above and other objects, features and advantages of the present invention will become apparent from the following description with reference to the accompanying drawings which illustrate examples of the present invention.

Fig. 1 is a block diagram of a multi-band multi-mode mobile telecommunications station; and
Fig. 2 is a flowchart of software used in the mobile station to control scanning operations.

[0007] Fig. 1 shows the basic blocks of the mobile phone, namely an RF stage 10 for receiving and transmitting, an interface stage 11 which includes frequency translation components and filtering, calibration, DAC and ADC functions, a DSP 12 which implements speech coding and decoding and various frequency control and synchronisation algorithms, and a CPU 13 which exercises control over the functioning of the phone in accordance with data stored in ROM 14 and in a SIM module (personal ID card) 15.

[0008] The CPU is, in particular, responsible for the timing of scans for nearby terrestrial base stations and for satellite stations. During scanning operations, the CPU commands the DSP to scan up to three frequency values during one TDMA frame. The CPU provides the DSP with the three frequency values to check, and progressively scans through the whole terrestrial band. This cycling normally continues until there is a detected signal sufficiently strong for AGC to be established within the RF stage and then RSSI levels are received. The CPU orders the frequencies in increasing levels of RSSI. If any is above a threshold value, the CPU commands the DSP to synchronise to the channel. The DSP attempts to decode broadcast messages by first synchronising its operation to the exact timing and frequency of the transmission and then attempts to decode a synchronisation burst. If this is successful this is registered by the CPU and the mobile station leaves out-of-zone (OOZ) operation and "camps" on the channel found.

[0009] Operations in the terrestrial and satellite bands involve different RF tuning procedures and different protocols for channel recognition and signal decoding. Thus, when searching terrestrial channels the DSP, interface and RF stages must operate in one mode and when searching for satellite channels, the same blocks must operate in a different mode. Fig. 1 shows each of the blocks 10, 11, 12 with a mode control switch 10_a, 11_a and 12_a control by the CPU for switching the blocks between modes when necessary.

[0010] The CPU is programmed to give priority to terrestrial operation. Network preference data is stored in the CPU ROM (preferably EEPROM) or in the SIM as a list of networks at successive addresses in the memory. The list could contain names for the networks, such as GSM 900 MHz, GSM 1800 MHz, satellite, or tokens for the network names, the networks being listed in order of preference. In the example described herein GSM 900 MHz is the most preferred network and satellite the least preferred. Such prioritisation is illustrated in Fig. 2. As shown, based on decisions as to whether the mobile station is currently in OOZ operation or is camped on a satellite or terrestrial channel, the CPU instructs the DSP to search at different intervals. If the mobile stations is in OOZ operation, then terrestrial searches are carried out every thirty seconds and satellite searches every two minutes. If the mobile station is camped on a satellite network channel, the terrestrial band is searched every two minutes. If the mobile station is camped on a terrestrial channel, the satellite band is searched every five minutes.

[0011] It will be clear to those skilled in this art that the principle described above can be extended to mobile stations capable of operating in three or more bands and in three or more different modes.

[0012] While a preferred embodiment of the present invention has been described using specific terms, such description is for illustrative purposes only, and it is to be understood that changes and variations may be made without departing from the spirit or scope of the following claims.

Claims

1. A mobile telecommunications station including a radio receiver capable of operating in a plurality of different frequency bands used by different networks, network preference data storage means for storing data which identifies a level of priority for each network, at least one of the networks being a preferred network, and a search control means determining the search frequency at which each network is searched in accordance with the preference data.

2. A mobile telecommunications station as claimed in claim 1 in which said search control means operates to vary the frequency of searching each network according to whether the mobile station is camped on a channel or not.

3. A mobile telecommunications station as claimed in claim 2 in which the search control means operates when the mobile station is not camped on a channel, the search the preferred network more frequently than the other network(s).

4. A mobile telecommunications station as claimed in claim 2 in which the search control means operates when the mobile station is camped on a channel of its preferred network to search the other network(s) less frequently than it searches its preferred network when camped on another network.

Fig. 1

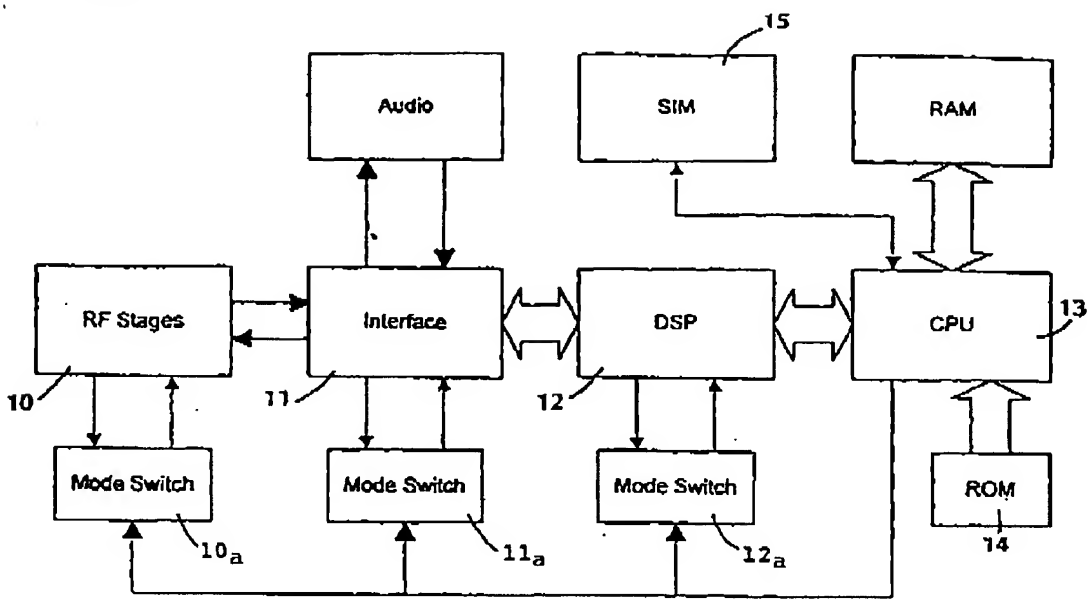
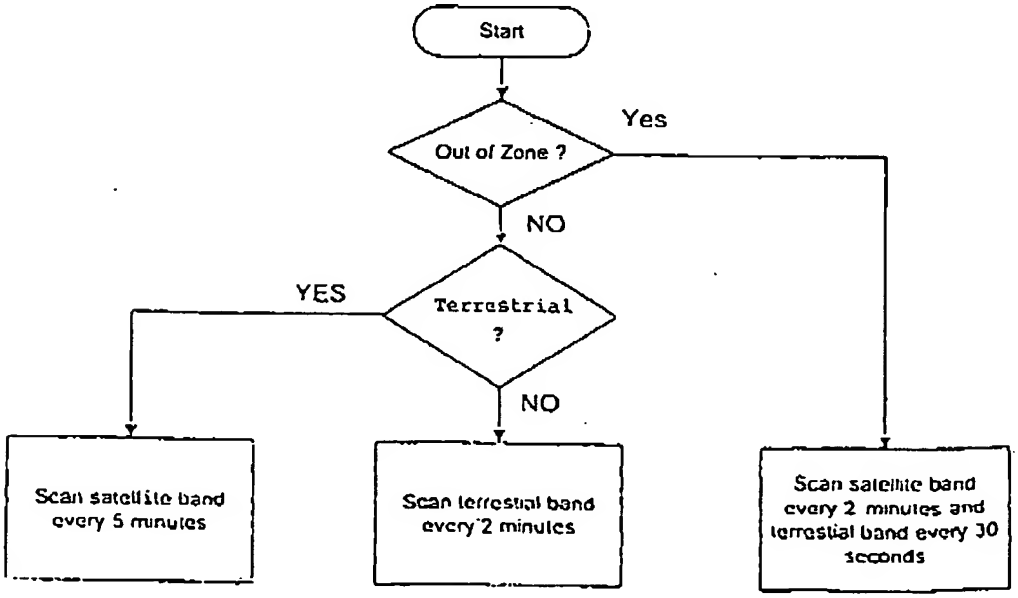

15
Audio
SIM
RAM
RF Stages
Interface
DSP
CPU
13
10
11
12
Mode Switch
Mode Switch
Mode Switch
ROM
14
10a
11a
12a

Fig. 2


Start
Out of Zone ?
Yes
NO
YES
Terrestrial ?
NO
Scan satellite band every 5 minutes
Scan terrestial band every 2 minutes
Scan satellite band every 2 minutes and terrestial band every 30 seconds

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 10 7300

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP 0 283 955 A (FUJITSU LTD) 28 September 1988 * abstract * * column 2, line 50 - column 3, line 3 * * claims 1,2 * * figures 4A,7 *	1-3	H04Q7/32
X	US 5 517 677 A (MOON BILLY G) 14 May 1996 * abstract * * column 4, line 6 - line 29 * * figures 1,3 *	1-3	
X	WO 98 10617 A (NOKIA MOBILE PHONES LTD ;NOKIA MOBILE PHONES INC (US)) 12 March 1998 * abstract * * page 3, line 12 - page 4, line 13 * * claims 1,7,8 * * figures 1,3 *	1,2	
X	EP 0 603 049 A (ALCATEL RADIOTELEPHONE) 22 June 1994 * abstract * * column 1, line 20 - line 41 * * column 2, line 51 - column 3, line 17 * * claims 1,3 * * figures 1,2 *	1,2	TECHNICAL FIELDS SEARCHED (Int.Cl.6) H04Q H04B
A	WO 93 16548 A (MOTOROLA INC) 19 August 1993 * abstract * * page 19, line 27 - page 26, line 10 * * figures 5,11 *	1	
E,L	GB 2 320 399 A (NEC TECHNOLOGIES) 17 June 1998 * the whole document *	1-4	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	24 September 1998	Simon, V

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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